

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

Rec'd
Wildlife Res. JAN 10 1986

ANNUAL WATER MANAGEMENT PLAN

1985 WATER USE DATA

1986 RECOMMENDATIONS

UNITED STATES DEPARTMENT OF INTERIOR

FISH AND WILDLIFE SERVICE

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Authored: Steven Brock Date: 1-7-86
Assistant Refuge Manager

Submitted: E. W. Strang Date: 1/8/86
Refuge Manager

Reviewed: Barnet W. Schuch Date: 1/11/86
Refuge Supervisor

Reviewed: Robert K... Date: 3/5/86

Reviewed: _____ Date: _____

I. RECORD OF 1985 WATER USE

A. Source of Supply

The winter of 1984-85 was the fourth consecutive year of extremely mild winter weather. Winter snowpack was almost non-existent. From December 1984 through February 1985, the greatest accumulation of snow was 6 inches with .51 inches of actual precipitation. This 6-inch snowpack slowly melted and was lost by mid-February. Less than 10 inches of precipitation was received for the entire year, which is only 70 percent of the normal 14.18 inches.

Spring run-off on some drainages started in late February and ran only through the end of March. Lost Creek, Sheep Creek and Lake Creek provided no run-off and all other refuge drainages provided only limited run-off in 1985.

Only #10 Lake and Sayer Bay were brought up to operational levels with this limited run-off. All other impoundments suffered from water deficiencies the previous year and conditions only became worse by late fall. Katy's Lake and #12 Lake, for the second year, were at a 20 year low. Homestead Lake was almost entirely dry except for twin lakes to the north and about 40 acres in Lost Creek Bay.

Refuge wetlands had a water deficiency of 31,473 acre feet prior to the spring run-off. The refuge recorded only 10,015 acre feet of water diverted during the year from all tributary sources.

B. Type of Rights

Under the Montana Water Rights Adjudication Law, all water rights filed prior to 1973 had to be refiled before April 15, 1982. The refuge water rights were researched and filed by the Regional Office engineering water resources section. A filing of 30 different water rights totaling 146,715 acre feet of water was made prior to the deadline.

The legal process now requires water courts to review all claims in Montana, and issue preliminary decrees. Claimants will then have the opportunity for objections and appeals before final water decrees are issued. This very lengthy process could drag on for many years before the refuge receives the final decree.

C. Quantity Used

A total of 10,015 acre feet of water was diverted from all tributary sources. With the deficit figure of 31,473 acre feet prior to run-off, all available water was diverted and utilized.

No water releases were completed this year due to low water levels.

TABLE I. MAJOR IMPOUNDMENT WATER DEFICIT

January 1, 1986

Impoundment	Elevation Jan. 1, 1986	Mgmt. Operating Elevation	Elevation Difference	Acre Feet Deficit	Surface Acres at Operational Level
Homestead Lake	1932.0 **	1937.65	-5.65	6,938	1,228.0
Gaffney Lake	1940.0 **	1945.0	-5.0	3,222	644.4
#10 Lake	1944.6	1945.8	-1.2	319	266.0
Deep Lake	1942.0 **	1945.8	-3.8	378	99.6
Long Lake	1940.0 **	1945.0	-5.0	346	69.2
#11 Lake	1950.4	1953.0	-2.6	497	191.2
#12 Lake	1951.0 **	1956.0	-5.0	2,396	479.2
Katy's Lake	1950.65	1954.4	-3.75	1,170	312.0
Medicine Lake	1940.9	1943.02	-2.12	17,797	8,394.8
Sayer Bay	1943.5	1946.0 *	-2.5	425	170.0

TOTAL				33,488	11,854.4
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* Planned Level for 1986

** Estimated Only - water level below gauge

TABLE II. COMPARISON OF WATER DEFICIENCIES *

(In Acre Feet)

Impoundment	1986	1985	1984	1983	1982
Homestead Lake	6,938	7,552	4,973	3,352	5,993
Gaffney Lake	3,222	1,998	709	516	3,022
#10 Lake	319	452	319	106	356
Deep Lake	378	378	249	159	287
Long Lake	346	215	76	55	377
#11 Lake	497	444	382	153	402
#12 Lake	2,396	1,821	1,006	455	1,198
Katy's Lake	1,170	1,061	749	281	705
Medicine Lake	17,797	16,957	10,242	10,242	19,969
Sayer Bay	425	595	374		
TOTAL	33,488	31,080	19,080	15,319	42,309

*Deficiencies based on water elevations on January 1 of each year.

D. Adequacy of Supply

Spring run-off was insufficient to fill all refuge impoundments this year. Only #10 Lake and Sayer Bay were brought to operational levels. Lack of available water prevented adequate flushing action in refuge impoundments. The reduced water levels coupled with three consecutive years without flushing of dissolved minerals has resulted in very high salinity levels in some impoundments.

TABLE III. WATER RECEIVED PER TRIBUTARY STREAM - 1985

<u>Tributary Source</u>	<u>Acre Feet of Water Diverted</u>
Muddy Creek	8,829
Lost Creek	0
Sheep Creek	0
Sand Creek	393
Cottonwood Creek	793
Lake Creek	0
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TOTAL	10,015

E. Improvements To Water Facilities During 1985

The Katy's Lake inlet structure was replaced in the late fall with a new combination screw gate/riser board structure with a stainless steel fish screen. This new facility was funded by Duck's Unlimited and will greatly improve water management capabilities over the old concrete/wooden screw gate structure which was about 50 years old.

Two old concrete/steel screw gate structures were rehabilitated by replacing the badly rusted slides that support the screw gate. These structures are located on #11 and #12 Lakes.

The outlet canal from Gaffney Lake into Tax Bay of Medicine Lake was cleaned of sediment to facilitate better water flows.

F. Effects Of Previous Years Objectives

As recommended, all available spring run-off was diverted to refuge impoundments. Sheep Creek, Lost Creek and Lake Creek did not provide any run-off during 1985. Katy's Lake and #12 Lake are at the lowest levels in 20 years. Sheep Creek Marsh and Breeser Dam impoundments received no run-off and were completely dry.

Only a very limited flushing activity occurred in #11 and #10 Lakes. All other impoundments did not reach sufficient water levels to permit flushing of dissolved minerals. This resulted in increased salinity and in general, very poor water quality. Some of the wetlands with the highest increases in salinity since 1983 include: Katy's Lake--3.7 to 10 parts/1,000, #11 Lake--2.0 to 4.5, #12 Lake--.75 to 3.2, and Homestead Lake--1.5 to 6.5.

These same wetlands showed very little waterfowl usage the entire year. Katy's Lake had virtually no waterfowl use.

All available waters from the Big Muddy Creek were diverted into Medicine Lake. By mid-April the lake reached its maximum for the year of 1942.18 feet MSL, which is .88 feet below recommended operational levels. These levels provided only marginal waterfowl pairing habitat along the shore and within the emergent vegetation stands west of Highway 16. The western grebe colony was forced to move to the fringe of emergent vegetation which was flooded, placing them in an area more accessible to predation. This water level appeared to be adequate to at least flood some vegetation to provide habitat for northern pike spawning.

In the early spring it was obvious there would not be enough run-off to fill Homestead Lake. It was decided not to release any water from the already reduced water levels of Medicine Lake. Big Muddy Creek flows originating from Wolf Creek brought Homestead Lake to the 1934.6 foot elevation. This elevation did not allow flooding of emergent vegetation and pair habitat was poor. The water was about 10 inches deep in the south bay which allowed raccoon and coyote predation on islands located several hundred yards from shore. No over-water nesting sites were available for waterfowl, grebes, or black-crowned night herons. Avian botulism was not a problem with the very low water elevations of mid-summer.

The low water level in Katy's Lake during 1985 permitted over-the-ice construction of a two acre nesting island. Lake Creek did not flow at any time throughout the year. To prevent future island erosion, rip-rap placement will be accomplished during the early winter of 1986, while water levels are still low.

All objectives were accomplished on Sayer Bay after spring filling of this unit to the recommended elevation. Emergent vegetation did not seem to spread, avian botulism was not excessive, and breeding pair/brooding habitat seemed ideal. Stop logs were in place prior to spring run-off, preventing rough fish entry from Medicine Lake. This impoundment appeared to have the best water quality and submerged vegetation of any unit on the refuge. Spring and fall migrational habitat was very good with about 5,000 mallards utilizing the impoundment for a month during early fall.

1985 SUMMARY

Water deficiency January 1, 1985	31,473 Acre Feet
Total water diverted through refuge	10,015 " "
Excess water released into Muddy Creek	0
Water diverted from Medicine Lake to Homestead Lake	0
Water deficiency on December 31, 1985	33,488 " "

TABLE IV. MONTHLY RECORD OF GAUGE READINGS - 1985

IMPOUNDMENTS	Homestead	Gaffney	#10	Deep	Long	#11	#12	Katy's	Medicine	Sayer
	Lake	Lake	Lake	Lake	Lake	Lake	Lake	Lake	Lake	Bay
Operational Level	1937.65	1945.0	1945.8	1946.2	1945.0	1953.0	1956.0	1954.4	1943.02	1945.0
January	1931.6 *	1941.9 *	1944.1 *	1942.0 *	1941.9 *	1950.6	1952.2	1951.0*	1941.0	1941.5
February										
March	1934.6		1945.6			1952.6				1943.0
April	1934.5		1946.3			1952.3	1952.4	1951.7	1942.18	1945.1
May	1934.3		1945.8		1941.8 *	1951.9	1952.2	1951.5*	1942.0	1945.0
June	1933.3		1945.6			1951.7	1952.1	1951.4*	1941.7	1944.7
July			1944.9			1951.0	1951.6*		1941.2	1944.0
August			1944.5			1951.6	1951.2		1940.6	1943.7
September			1944.3			1951.4		1950.65**	1940.8	1943.5
October										
November			1944.6			1950.4	1951.0*		1940.9	1943.5
December	1932.0 *	1940.0 *	1944.6	1942.0 *	1940.0 *	1950.4	1951.0*	1950.65*	1940.9	1943.5

*Estimated Only - water level too low to read on gauge.

**Water elevation surveyed with a level.

II. RECOMMENDATIONS AND OBJECTIVES FOR WATER MANAGEMENT IN 1986

A. General recommendations for all impoundments on the refuge are as follows:

1. Fill all refuge impoundments as early as possible to ensure retaining all available flow from the spring run-off.
2. Fill all upper impoundments with waters from Lake Creek, Sand Creek and Cottonwood Creek before allowing these waters to enter Medicine Lake.
3. Provide for as much flushing action as possible with available spring and summer run-off. This will improve water qualities by reducing salinity.
4. Continue to collect water quality information by taking salinity and conductivity readings for all major water flows entering or being discharged from the refuge. Spring and late fall readings should be collected, as in the past, for all major impoundments. The collection of this data will document any changes in water quality occurring over the years.

Table V shows the priority of water use on the refuge. Priority I impoundments should be filled and maintained before priority II impoundments.

TABLE V. PROPOSED WATER USE PRIORITY

UNIT	PURPOSE	PRIORITY
#12 Lake	Nesting, brooding, storage	1
Katy's Lake	Nesting, brooding, storage	1
#11 Lake	Nesting, brooding, storage	1
#10 Lake	Nesting, brooding, storage	1
Gaffney Lake	Nesting, brooding, storage, fish rearing	2
Deep Lake	Nesting, brooding, storage	1
Long Lake	Nesting, brooding, storage	2
Sayer Bay	Nesting, brooding, storage	1
Medicine Lake	Nesting, brooding, storage, fish rearing	2
Sheep Creek Dam	Nesting, brooding, storage	1
Breaser Dam	Nesting, brooding, storage	1
Homestead Lake	Nesting, brooding, storage	1

B. Specific Recommendations and Objectives For Individual Impoundments for 1986.

1. Homestead Lake: This impoundment is basically dry and will require approximately 6,938 acre feet of water to meet management objectives.

1. (continued) It is recommended to divert all available flows from Sheep Creek, Lost Creek and Big Muddy Creek into this impoundment. A different management strategy will be implemented this year. If winter snowpack and resulting spring water flows appear to be below normal again, all available water flows from the Big Muddy will be allowed to bypass the diversion structure and continue down the Muddy Creek. It will then be diverted into Homestead Lake until it is brought up to the full operational elevation of 1937.65. If adequate flows are available to fill both Homestead and Medicine Lake, flushing of dissolved minerals will be accomplished by diverting water into Medicine Lake and then releasing water through structure #6 back into the Muddy Creek drainage.

Specific Objectives To Be Met in 1986

- a. Waterfowl breeding pair habitat will be optimum at spring operational level.
- b. Over-water nesting sites in emergent vegetation for waterfowl, grebes, and black-crowned night herons will be optimum at spring operational levels.
- c. Constructed nesting islands will provide secure nesting sites for geese and other waterfowl at spring operational levels.
- d. Aquatic vegetation should flourish in this relatively shallow impoundment.
- e. Experimental fish screens should be constructed for the three inlet risers. These screens will reduce adult carp from entering this impoundment from the Muddy Creek. Reduction of carp should improve water quality and growth of aquatic vegetation in this impoundment.
- f. To reduce the hazard and severity of avian botulism, the lake level will be drawn down beginning in late June. The volume of water released must be controlled to prevent flooding the access crossing to BIA hay fields downstream. The water level will be at 1936.0 elevation by July 1, and further reduced to an elevation of 1934.3 by August 1. At this level, water will be removed from the emergent shoreline vegetation stands, which seem to contribute to the severe botulism outbreaks.
- g. If water levels permit, a release of water from Medicine Lake in mid-September can be diverted into Homestead Lake. This will bring levels back up to a minimum of 1935.50 elevation to provide adequate fall migrational habitat for waterfowl. Approximately 2,000 acre feet of water from Medicine Lake will be required to accomplish this objective.

- h. If it appears that carp have re-infested Homestead Lake in significant numbers, a water release can be scheduled about November 1, to reduce the elevation to 1933.0 feet. At this elevation a winterkill of carp should occur.
2. Lakes #10, #11, #12, Gaffney Lake and Long Lake: Water levels for this series of water units are all dependent on spring run-off from Cottonwood, Sand and Lake Creeks. The present water level of these units range from 1.2 to 5.0 feet below operational levels. Upstream impoundments will be filled first, then each impoundment below. If flows are adequate, water control structures will be opened rather than relying on spillways. This provides the best flushing action, and allows for the reduction of accumulated salinity in these units.

Specific Objectives To Be Met In 1986

- a. If spring run-off is adequate, all impoundments will be filled to operational levels as early as possible.
 - b. If water reaches operational levels, breeding pair habitat for waterfowl will be maximized.
 - c. At operational levels, constructed and natural nesting islands will remain secure, and yet minimize erosion by wind and wave action.
 - d. No water releases or drawdowns will be accomplished. By maintaining water levels as close to operational level as possible, brooding habitat will be optimum. After evaporation and loss to seepage, levels will remain adequate for fall migration.
 - e. An experimental fish screen will be constructed by refuge personnel, and placed in the #10 Lake outlet to Gaffney Lake in an attempt to reduce adult carp in #10 Lake. If successful, improved submergent vegetation conditions should remain unchanged.
 - f. Lakes #10 and Gaffney have been historic sites for avian botulism. Rapid flooding of shallow areas following heavy summer rain storms seems to trigger outbreaks in these impoundments. This outbreak can be minimized or the severity reduced by maintaining constant water levels.
3. Katy's Lake and Deep Lake: These two natural sumps do not have outlets providing the option of flushing and are the most alkaline on the refuge. Limited surface drainage and diverted water from the spring run-off are the only source of fresh water for these two marsh units.

Specific Objectives To Be Met In 1986

- a. Following the completion of the Duck's Unlimited funded Katy's Lake island and water control structure, this lake should be filled to maximum operational levels if water is available.

- b. Katy's Lake has a history of botulism. Rapid rises in mid-summer water levels must be prevented to alleviate losses.
 - c. Deep Lake should be filled to operational level to maximize breeding pair and brood habitat.
4. Sayer Bay: This impoundment will be in its third year of operation since the completion of the Sayer Bay Dam. This unit demonstrated a high potential for waterfowl production in 1984 and 1985, as well as providing excellent migrational habitat during 1985. A severe avian botulism outbreak occurred during the initial flooding of this area in 1984, however, stable water levels throughout the summer of 1985 resulted in only minor losses. Avian botulism will be a yearly concern on this unit.
- a. This is a relatively new dam with a spillway elevation of 1946.0 feet MSL. To prevent erosion, the elevation of this impoundment has been slowly increased in one foot increments on successive years, to allow the dam to stabilize and become vegetated. This year it is recommended to raise the operational level by one foot to reach the spillway elevation of 1946.0 feet. This increased depth will maximize surface acres of water, prevent undesirable increase of emergent vegetation, and may reduce avian botulism by reducing the amount of very shallow marsh.
 - b. The stop log structure will have the appropriate boards in place prior to spring run-off in order to maintain the 1946.0 water elevation. This is required to eliminate all fish entry into this impoundment. This barrier will eliminate carp, and should improve water quality and submergent vegetation. Preventing northern pike from entering this impoundment will reduce the chance of losing these fish to winterkill next winter.
 - c. This impoundment will be closely monitored for avian botulism. With the large number of waterfowl and broods utilizing the area, the potential for significant botulism losses is high. If a significant outbreak occurs, it is recommended to pull all the stop logs, and quickly draw the water level down to about the 1942.0 elevation. At this elevation the shallow water along the edge is eliminated. This same method was used effectively to reduce losses in 1984. Prevention of rapid increases in water levels, following heavy mid-summer thunderstorms, is desirable. Reflooding of shallow vegetated mud flats can trigger an avian botulism outbreak.
5. Medicine Lake: The mid-winter elevation of this lake is 2.12 feet below the operational level of 1943.02. This will require about 17,797 acre feet of water to meet management objectives. Since Medicine Lake is a priority II impoundment, it will receive run-off from tributaries only after all other impoundments are filled. Once Homestead Lake reaches operational level in the spring, all available waters from the Big Muddy Creek will be diverted into Medicine Lake. If run-off exceeds this 17,797 acre feet, it is recommended to allow the maximum level to reach an elevation of 1944.0. At this level, water will spill over the #4 spillway until slowly receding to the 1943.02 level. If levels exceed

the 1944.0 elevation, the #4 structure should be opened to reduce the volume of water flowing over the spillway.

Heavy silt laden waters from Big Muddy Creek, following heavy summer thunderstorms, will be kept from entering Medicine Lake using the new #1 structure on the diversion canal. This will alleviate sediment deposits on the west end of Medicine Lake. Medicine Lake water levels could be high enough this year that the need for this silt laden water will not be required.

By allowing Medicine Lake to reach an elevation of 1944.0 feet in the early spring, and allowing it to recede to 1943.02 by early summer, the following objectives will be met.

- a. Waterfowl breeding pair habitat will be adequate. Water levels in emergent vegetation will provide nesting locations for over-water nesters including diving ducks, grebes, and black-crowned night herons.
- b. Natural islands will be secure and provide nesting sites for geese, pelicans, cormorants, and great blue herons.
- c. After normal water loss during the summer, early fall water levels will still be adequate to allow water to be released to Homestead Lake. This will provide desirable migrational waterfowl habitat on both Homestead and Medicine Lake. This slightly reduced water level at Medicine Lake will still provide adequate water depth to protect the over-wintering fish population.
- d. This elevation will provide excellent early spring northern pike spawning habitat in the emergent vegetation stands west of Highway #16.
- e. Erosion of islands and shorelines by wave action will not be excessive. This level has been commonly reached in past years without causing excessive damage.

WATER MANAGEMENT PLAN/
USE REPORT
SHORT FORM

Northeast Montana WMD
Johnson Lake WPA (Roosevelt County, MT)

November 1, 1985

Station Name
Water rights filed for in 1981, however,
final decrees have not been received.
Water Right No.

Date of Inspection
Unnamed coulee (Tributary to Big
Muddy Creek)
Source(s)

Water Diverted: Yes ☐ No ☒
No spring flows due to drought

Means of Diversion Dam
Rate Natural flow of 200 cfs up to
1,050 acre feet

*Impoundment(s): Yes ☐ No ☐

Water Level Approximately 4 feet low
(Elevation or Est. Storage Amount)

*Well(s):
Free Flowing gpm
Pumped gpm

Type of Use:
Surface Irrigation
(Crop)
Fish & Wildlife X
Stock
Domestic
Other

Overall Climactic Conditions: Third consecutive year of extreme drought.
Third year in a row with no available run-off.

Condition of Facilities: Dam in good condition. Boards in riser structure
were replaced this summer.

Proposed Water Program: Dependent on spring run-off, fill impoundment to
capacity. If flows appear adequate, allow flushing to remove accumulated dissolved
solids. Maintain as close to capacity as long as possible.

Comments: This impoundment is extremely low with only about 6 inches of
water remaining.

WATER MANAGEMENT PLAN/ USE REPORT SHORT FORM

Northeast Montana WMD
Carlson WPA (Sheridan County, MT)

November 15, 1985

Station Name
Water rights filed for 1981, however,
final decrees have not been received.
Water Right No.

Date of Inspection
Unnamed coulee (Tributary to Big Muddy
Creek
Source(s)

Water Diverted: Yes ___ No X
No flow due to drought

Means of Diversion Dam
Rate Natural flow up to 40 acre feet

*Impoundment(s): Yes X No ___

Water Level Dry
(Elevation or Est. Storage Amount)

*Well(s):
Free Flowing _____ gpm
Pumped _____ gpm

Type of Use:
Surface Irrigation _____
(Crop) _____
Fish & Wildlife X _____
Stock _____
Domestic _____
Other _____

Overall Climactic Conditions: Third consecutive year of extreme drought with below normal precipitation and spring run-off. Run-off was non-existent this year.

Condition of Facilities: Dam is the state highway road bed which is in excellent condition.

Proposed Water Program: Water levels entirely dependent on spring run-off and the culvert elevation in highway right of way, regulates surface elevation of this wetland basin.

Comments: Wetland was completely dry again this year.